

# THE WEATHER AND CIRCULATION OF MAY 1956<sup>1</sup>

## Another April-May Reversal

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### 1. TEMPERATURE REVERSAL IN THE UNITED STATES

In studying the annual course of month-to-month persistence in the United States, Namias [1] found that April-May was characterized by less persistence than any other pair of months except October-November. This tendency for change in long-period weather regimes was evidenced by monthly anomalies of precipitation, surface temperature, and 700-mb. height. Recent years have furnished additional examples of April-May reversals, particularly in 1954 [2].

This year another striking change in monthly weather and circulation occurred from April to May. This is well illustrated in figure 1, which compares the monthly mean temperature anomalies observed in the United States during April and May of 1956. Whereas April was characterized by below and much below normal temperatures in all parts of the country except the Pacific Northwest [3], May was dominated by unseasonable warmth in all sectors except the extreme Southwest and Northeast. Of 100 stations evenly distributed over the country, there were only 49 in which the temperature anomaly did not change by more than one class (out of five). This represents considerably less persistence than expected either by chance (59) or from past years (58) [1]. In portions of the Central Plains an extreme four-class change occurred, from much below to much above normal (fig. 1).

### 2. CHANGES IN THE GENERAL CIRCULATION

#### HEMISPHERIC

This reversal in temperature was accompanied by an equally striking change in circulation pattern. This is illustrated on a hemispheric basis by the zonal wind speed profiles shown in figure 2. At the 700-mb. level wind speeds in the Western Hemisphere during May (solid) were stronger than during April (dashed) between 60° and 40° N., but weaker between 40° and 20° N. From April to May the axis of maximum west wind shifted 10° northward and increased in speed by 4 m. p. s. Normally, little change in 700-mb. zonal wind speed profile occurs during these two months [4]. At the 200-mb. level the axis of the mean jet stream was displaced northward by

over 20°, from about 25° N. in April (dashed) to about 48° N. in May (solid). As at 700 mb., wind speeds increased from April to May between 60° and 40° N., and decreased to the south. However, the speed at the latitude of maximum 200-mb. wind was weaker during May than April.

Changes in character of the hemispheric wind belts from April to May are also well portrayed in terms of the stand-

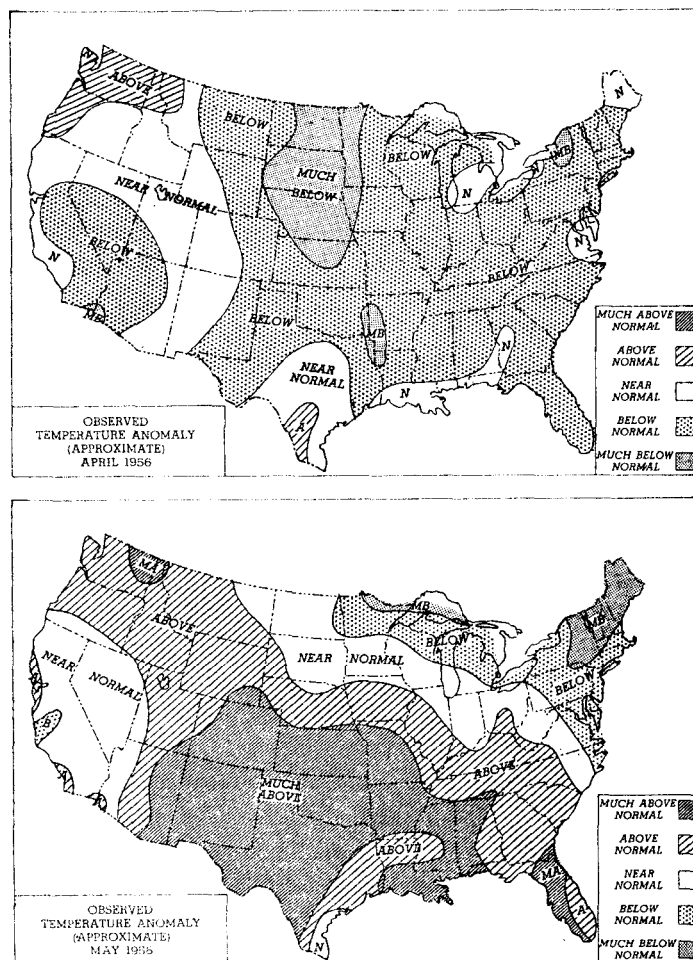


FIGURE 1.—Monthly mean surface temperature anomalies for (A) April 1956, (B) May 1956. The classes above, below, and near normal occur on the average one-fourth of the time; much below and much above each normally occur one-eighth of the time. Note marked warming from April to May in all parts of the country except extreme Southwest and Northeast.

<sup>1</sup> See charts I-XV following page 205 for analyzed climatological data for the month.

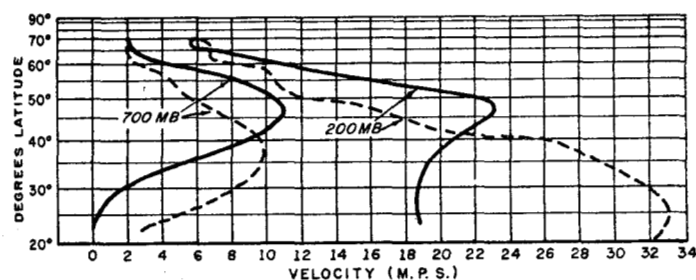


FIGURE 2.—Monthly mean zonal wind speed profiles for the Western Hemisphere at 700 mb. and 200 mb. for April (dashed) and May (solid) 1956. At both levels the latitude of maximum west wind shifted sharply northward from April to May.

and fixed-latitude indices [5]. Table 1 gives monthly mean values of these indices at the 700-mb. level. Both temperate (or zonal) and polar westerlies increased in value from April to May this year, contrary to the normal seasonal trend which calls for a decline. Conversely, the subtropical westerlies weakened much more than normal, going from above normal values during April to below normal in May. All of these changes reflect the marked northward shift of the westerlies noted in figure 2. They indicate that whereas April was a classic low (zonal) index month with an expanded circumpolar vortex, May was just the opposite; namely, a high index month with a contracted circumpolar vortex [5].

#### REGIONAL

Changes in the general circulation on a regional basis are perhaps best illustrated by figure 3, the anomalous 700-mb. height change from April to May. This chart was prepared by subtracting the 700-mb. height departure from normal observed last month (fig. 1 of [3]) from its counterpart for this month, reproduced in figure 4. The largest anomalous height change in figure 3 is the fall of 590 feet near Baffin Bay, where a persistent blocking ridge during April [3] was replaced by an abnormally deep cyclonic vortex in May (fig. 4). A similar fall took place near Iceland, where a mean 700-mb. height anomaly of -330 feet was the largest departure from normal observed anywhere in the Northern Hemisphere during May (fig. 4). As frequently happens [5], these height falls in the subpolar region were accompanied by rises in the subtropics. In fact, a continuous band of anomalous height rises (fig. 3) and above normal heights (fig. 4) extended across middle latitudes from Japan eastward to Europe,

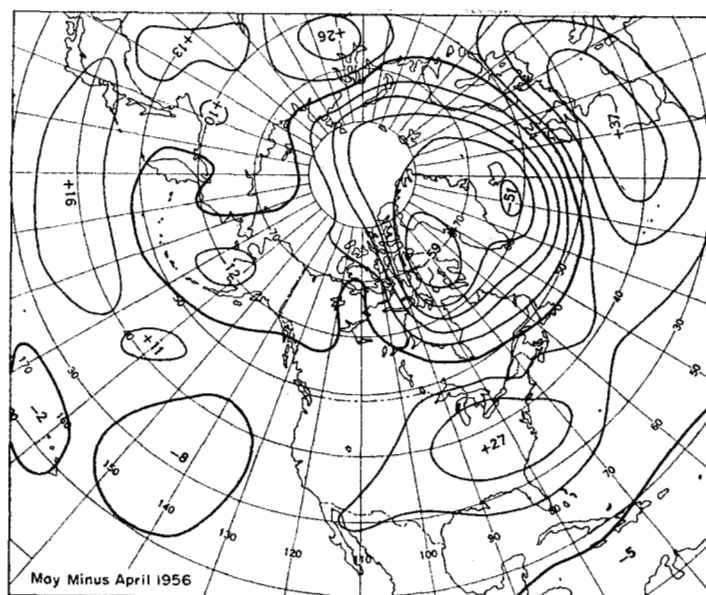


FIGURE 3.—Difference between monthly mean 700-mb. height anomaly for April and May 1956 (in tens of feet). Large anomalous height changes in eastern North America and Atlantic were indicative of marked acceleration and northward displacement of main belt of westerlies from April to May.

with largest rises in Europe and the eastern United States. The resultant acceleration of the westerlies north of 40° N., and their deceleration to the south, were most marked in the Atlantic and eastern North America, but also evident in the Pacific (fig. 3).

The geographical distribution of the field of mean horizontal geostrophic wind speed at the 700-mb. level and its departure from the May normal are illustrated in figure 5. Confluence of two branches of the 700-mb. jet stream over Japan produced a strong single jet downstream in the Pacific, with maximum speed of 20 m. p. s. (fig. 5A), 10 m. p. s. greater than normal (fig. 5B), just south of the Aleutians. The jet stream was weak and split into several branches over western North America; but from the Great Lakes northeastward to Scandinavia it was well defined and stronger than normal, by as much as 11 m. p. s. in the eastern Atlantic.

The 700-mb. jet streams drawn in figure 5A have been reproduced as solid curves in figure 6 for ready comparisons with their counterparts of April, drawn as dashed curves. It can be seen that the axis of the principal west-to-east jet was displaced about 5° of latitude northward in the United States from April to May. This northward shift was even more pronounced at the 200-mb. level, where strong mean jets were clearly delineated along the Gulf Coast in April (dashed) and over the Great Lakes in May (solid).

Northward displacement of the jet stream from April to May was accompanied by corresponding shifts of other features of the general circulation. For example, the principal track of sea level cyclones in the United States shifted northward during the month from a position

TABLE 1.—Monthly mean values of standard indices of the 700-mb. westerlies in the Western Hemisphere during April and May 1956 (in meters per second).

Index	Latitude belt	Month	Observed	Normal	Anomaly
Polar.....	55° N.-70° N.	April.....	2.6	3.7	-1.1
		May.....	3.2	1.9	+1.3
Temperate.....	35° N.-55° N.	April.....	7.5	8.3	-0.8
		May.....	9.7	7.7	+2.0
Subtropical.....	20° N.-35° N.	April.....	6.4	5.8	+0.6
		May.....	1.6	4.1	-2.5

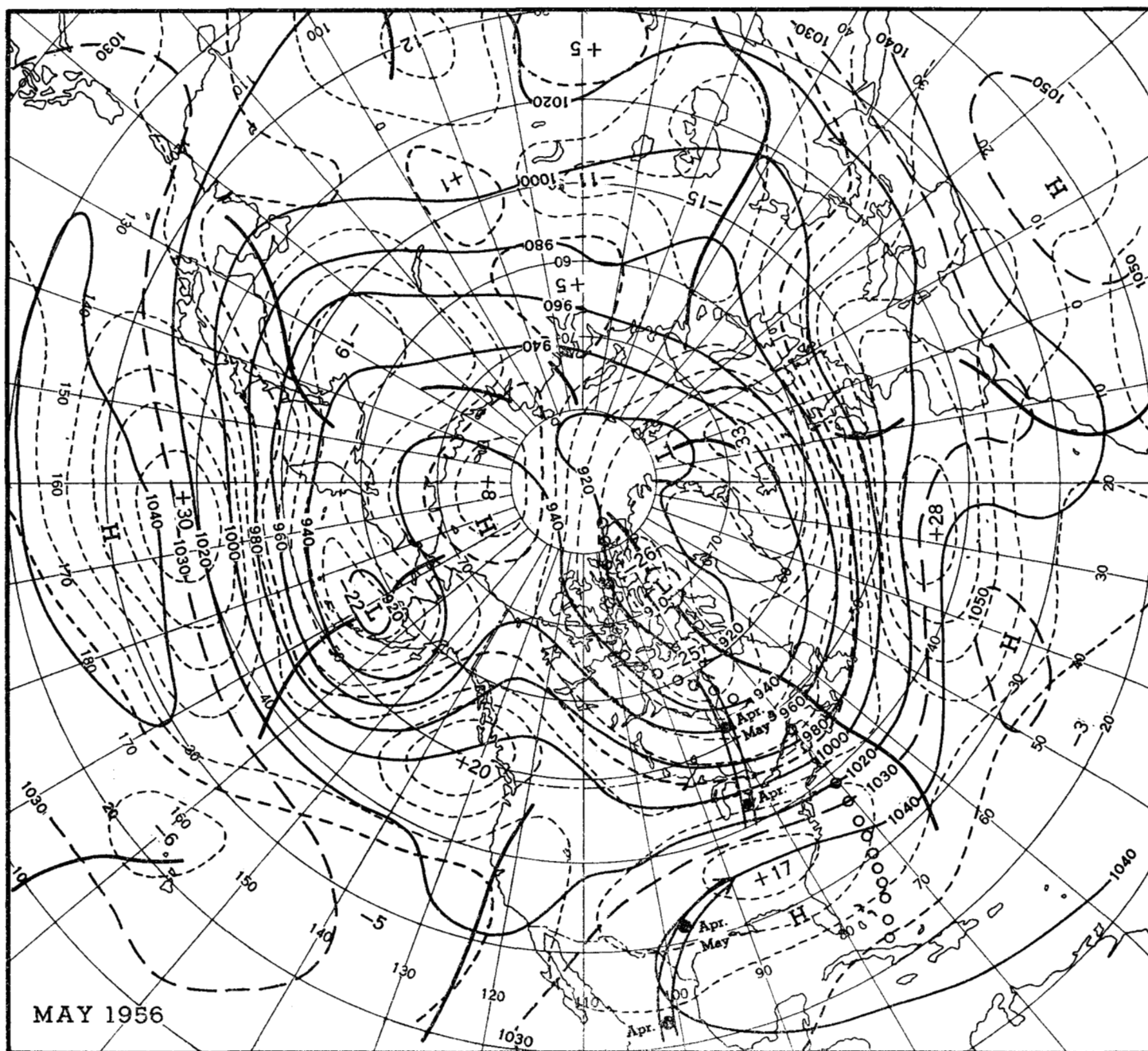


FIGURE 4.—Monthly mean 700-mb. height contours and departures from normal (both in tens of feet) for May 1956. Trough (heavy solid line) extending southward from Baffin Bay to Bermuda was east of its April position (line of open circles) at all latitudes. Centers of positive anomaly over Tennessee (+170 ft.) and negative anomaly over Hudson Bay (−250 ft.) moved northward from their April locations along tracks denoted by open arrows.

through the Ohio Valley in April, shown by the dashed arrow in figure 7A, to a position through the Upper Lakes in May, shown by a solid arrow. Each of these positions was a few degrees north of the 700-mb. jet stream for the appropriate month (fig. 6).

A similar northward displacement was experienced by the two largest centers of mean 700-mb. height departure from normal over the United States during April and May. The trajectories of these two anomaly centers are given by the open arrows of figure 4. The positive center

moved northward from Mexico in April, to Texas during mid-April to mid-May, and then northeastward to Tennessee in May. The negative center was located over the Great Lakes in April, James Bay in mid-April to mid-May, and Hudson Bay in May. Thus a negative anomaly center over the eastern United States in April was replaced by a positive center in May, resulting in an anomalous height change of +270 ft. in figure 3.

In addition to the northward shift described above, a significant eastward displacement of several circulation

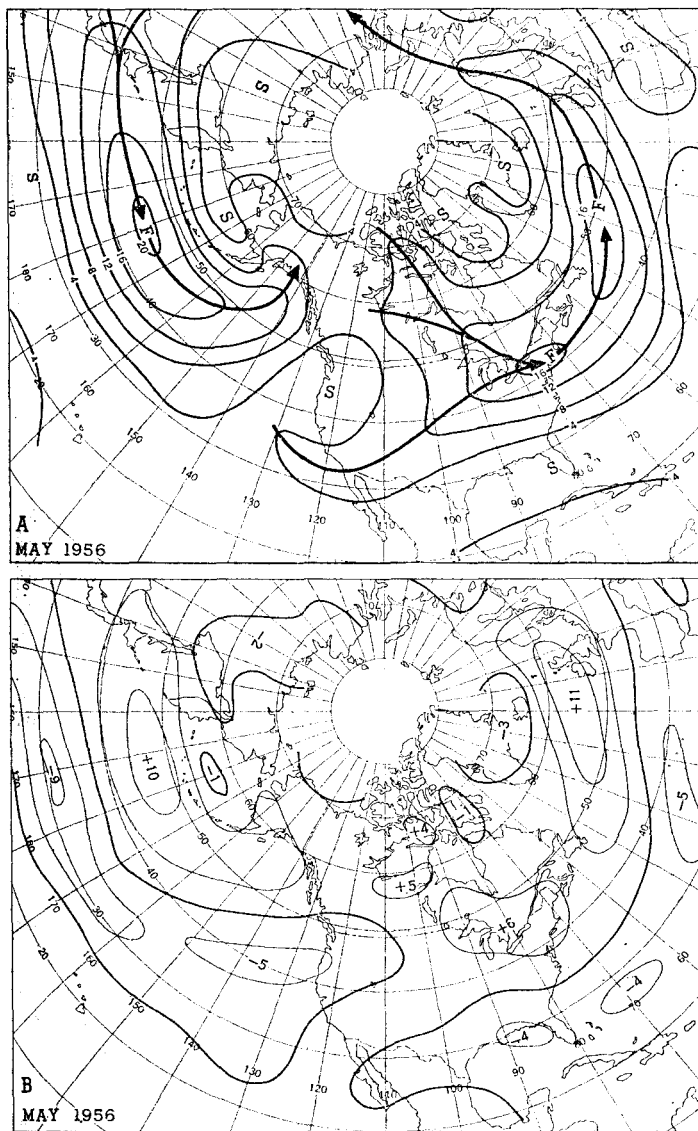


FIGURE 5.—(A) Mean 700-mb. isotachs and (B) departure from normal wind speed (both in meters per second) for May 1956. Solid arrows in (A) indicate axis of the mean jet stream at the 700-mb. level. Note center of fast wind speed (F) in the Northeast, where speeds were 6 m. p. s. above normal, and centers of slow speed (S) in Southeast and Northwest, where speeds were 4 meters per second below normal.

features occurred from April to May. Figure 4 contains the April position of the minimum-latitude trough in eastern North America (line of open circles). Comparison with the May position (solid line) indicates that this trough moved eastward at all latitudes from  $20^{\circ}$  to  $80^{\circ}$  N. A similar eastward shift took place in the principal track of sea level polar anticyclones from the Arctic Ocean and Canada into the northern United States. This track is shown in figure 7B by solid arrows for May and by dashed arrows for April. During both months the High track was extremely well marked and located almost directly beneath an axis of the 700-mb. jet stream. This meridional branch of the jet was well delineated and stronger than normal, as illustrated in figure 5 for May. Figure 6

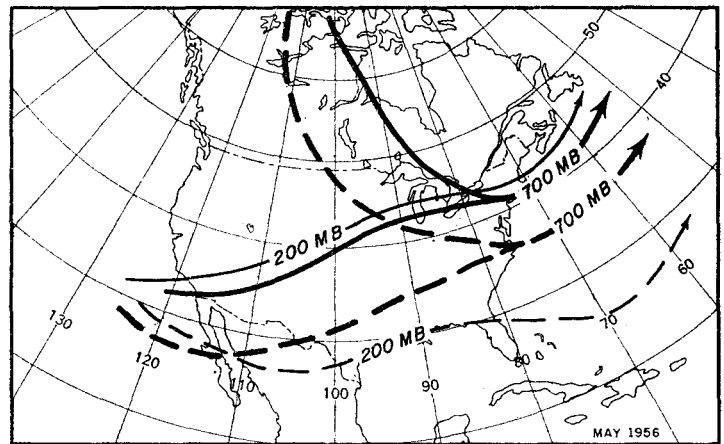


FIGURE 6.—Location of axes of jet streams on monthly mean charts at 700 mb. (heavy lines) and 200 mb. (thin lines) for April (dashed) and May (solid) 1956. At both levels marked northward displacement from April to May was evident in the United States. Eastward shift of 700-mb. jet in Canada was also important.

shows that the eastward displacement of this portion of the jet stream from April to May was just as well marked as the corresponding displacement of the primary anticyclone track (fig. 7B) and the monthly mean trough (fig. 4).

### 3. WEATHER OF THE MONTH

#### TEMPERATURE

Average temperatures during May were below normal northeast of a line extending approximately from Wilmington, N. C., through Milwaukee, Wis., to Havre, Mont. (Chart I-B). Largest departures from normal, in excess of  $4^{\circ}$  F., were recorded in New England, New York, and northeastern Minnesota. It was the coldest May on record at Caribou, Maine and the coldest since 1917 at many other stations in the Northeast. On the 9th, the following minimum temperatures (in  $^{\circ}$ F.) were the lowest ever recorded in May: Portland, 23; Albany, 27; Hartford, 28; Providence, 29; and Norfolk, 36. In addition many new minimum records for individual dates were set during the month, but these are too numerous to mention here. Damage to crops by killing frost was severe and widespread, and many stations reported their latest freeze on record on the 25th. Further details are contained in an article by Lautzenheiser [6].

Cold air in the Northeast may be related to several features of the general circulation. Figure 4 shows that the region was dominated by stronger than normal northwesterly flow at the 700-mb. level. This flow had an extremely long fetch from western Canada and the Arctic Ocean to the north. Along its axis, delineated by the solid jet stream arrow in figure 5A, wind speeds averaged about 4 m. p. s. greater than normal (fig. 5B). It was instrumental in steering a large number of continental polar anticyclones at sea level from Canada and the Arctic

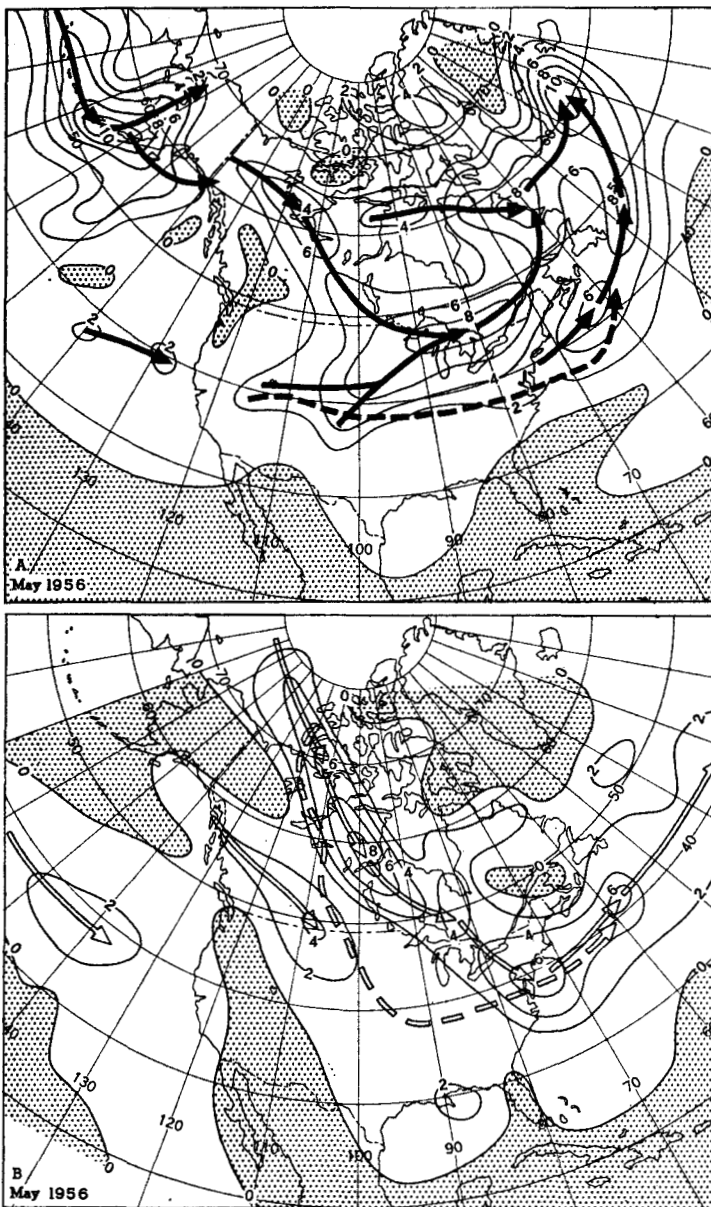


FIGURE 7.—Frequency of (A) cyclone and (B) anticyclone passages (within 5° squares at 45° N.) during May 1956. Principal cyclone tracks are indicated by solid arrows and anticyclone tracks by open arrows, with corresponding positions during April 1956, dashed. Note northward shift of cyclone track in United States April to May and eastward displacement of track of polar anticyclones.

into the northeastern United States. Their tracks are given individually in Chart IX and summarized in figure 7B. The passage of each of these Highs was responsible for a fresh outbreak of cold air in northern and eastern sections of the United States. The source region for this air is normally very cold, but this year it was much colder than normal. This is shown by figure 8, which gives the mean departure from normal of thickness in the layer between 1,000 and 700 mb. observed during May 1956. Temperatures averaged below normal in nearly all parts of Canada and the Arctic Ocean, with the greatest departures

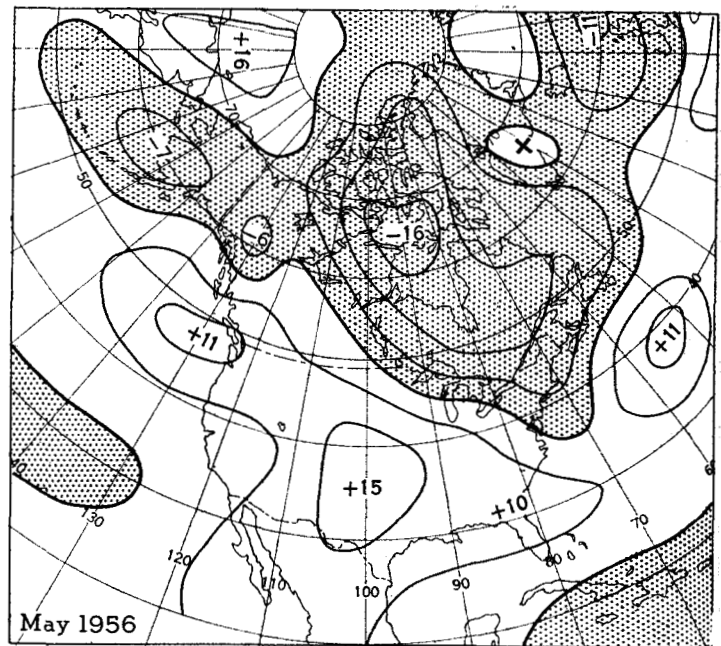


FIGURE 8.—Departure from normal of monthly mean thickness (1,000-700 mb.) for May 1956, with subnormal values stippled. As in April [3], the polar source region over central Canada was unusually cold.

(over 5° C.) in northern Hudson Bay. This frozen Hudson Bay was precisely the region from which most of the Northeast's cold weather emanated.

The only other portion of the United States with below normal temperatures during May was the extreme Southwest. In the States of California and Nevada temperatures averaged from 0° to 2° F., below normal (Chart I-B). Cool air in this region was apparently rather shallow since the thickness of the layer from 1,000 to 700 mb. averaged above normal for the month (fig. 8). Above normal cloudiness (Chart VI-B) and precipitation (Chart III) in the monthly mean trough (fig. 4) diminished sunshine (Chart VII) and solar radiation (Chart VIII) and kept surface temperatures low. In addition, some cool Pacific air was carried into the Southwest by a somewhat stronger than normal jet stream at the 700-mb. level (fig. 5).

In the remainder of the United States average temperatures for May were above normal (Chart I-B). Largest departures, over 6° F., were observed in the vicinity of the Texas-Oklahoma Panhandle, but departures in excess of 2° F. were recorded over a wide and continuous belt from Key West in the extreme Southeast to Seattle in the far Northwest. This was the warmest May on record at Dodge City, Kans., and Dallas, Fort Worth, and Wichita Falls, Tex. Throughout the country, many new records, too numerous to mention, were set for maximum temperatures on individual dates. A few of these were absolute maxima for May, and these are listed in table 2.

This abnormal warmth was directly related to the monthly mean circulation. Throughout the area of above normal temperatures both 700-mb. heights (fig. 4) and 1,000-700-mb. thicknesses (fig. 8) averaged above normal,

TABLE 2.—Maximum temperatures during May 1956 which equaled or exceeded highest recorded on any previous May day

Station	State	Temperature (° F.)	Date
Los Angeles.....	California.....	97	16
Albuquerque.....	New Mexico.....	*97	31
Grand Junction.....	Colorado.....	95	31
Salem.....	Oregon.....	95	17
Salt Lake City.....	Utah.....	*93	31
Olympia.....	Washington.....	92	30

\*Equaled previous record.

while geostrophic relative vorticity at 700 mb. was strongly anticyclonic (fig. 9). Of special importance was the 700-mb. high center over northern Florida and the center of above normal heights to its north (fig. 4). This was a warm High composed primarily of maritime tropical air masses. On the monthly mean map at sea level (Chart XI) it was represented by a strong westward extension of the semipermanent Azores-Bermuda high pressure belt. Consequently, stronger than normal southerly flow dominated most of the eastern half of the United States at sea level (Chart XI inset) and the southern half at 700 mb. (fig. 4). As a result of this flow, warm air from low latitudes was carried northward into most of the Nation, while cold air masses from Canada were confined to the Northeast. Containment of the cold air was aided by the existence of stronger than normal westerlies (fig. 5) in a pronounced confluence zone stretching from the Northern Plains eastward through the Great Lakes to New England (fig. 4).

## PRECIPITATION

As is frequently the case, precipitation, because of its discontinuous nature, was more difficult to relate to the monthly mean circulation than was temperature. Most straightforward, perhaps, was the large area of above normal precipitation observed in the Far West (Chart III). More than twice the normal amount for May fell in parts of California, Oregon, Idaho, and Nevada. This was the wettest May on record at Red Bluff, Calif., and Meacham, Oreg., and the second wettest at Blue Canyon, Calif. This precipitation was associated with a mean trough through the area at all levels of the troposphere (Charts XI to XV) and marked cyclonic relative vorticity at 700 mb. (fig. 9). Heavy rains combined with rapid snowmelt due to above normal temperatures produced flooding in sections of Idaho, Washington, Montana, and Oregon during the last week of May and first week of June. The worst flood on record occurred on the Kootenai River in Idaho, while lesser floods were reported on the Snake and Columbia Rivers.

Another band of plentiful precipitation stretched across the northern portion of the country from the Continental Divide eastward to New England, with heaviest amounts in the Northern Rocky Mountain States and the Great Lakes region. Akron, Ohio, reported a total of 9.60 inches for its wettest May in 70 years, while it was the 2d wettest

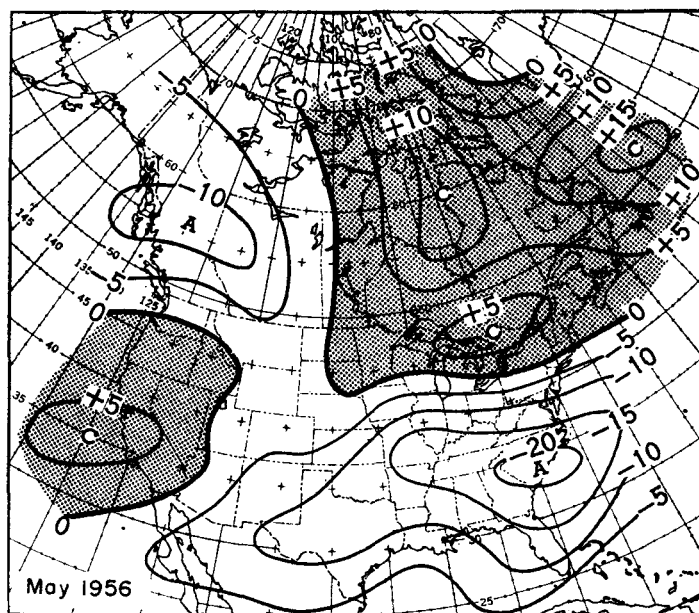


FIGURE 9.—Vertical component of the mean geostrophic vorticity at 700 mb. for May 1956, in units of  $10^{-6}$  sec.  $^{-1}$ . Cyclonic vorticity and anticyclonic vorticity are considered positive and negative, respectively, and labeled C and A at centers. Anticyclonic vorticity dominated all parts of the United States except the Southwest and Northeast.

May on record at Grand Rapids, Mich. Muskegon, Mich., had 12 thunderstorm days, the most ever observed in May. Much of this precipitation fell in an area of confluence (fig. 4) and cyclonic vorticity (fig. 9) at 700 mb., above a trough at sea level (Chart XI), and underneath a pronounced upper level jet (fig. 6). It was primarily cyclonic and frontal in nature as an unusually large number of closed Lows (as many as 9 per  $5^{\circ}$  box) traversed the Great Lakes region during the month (Chart X and fig. 7A).<sup>2</sup> Some of these cyclones were responsible for severe weather in the Midwest on several days of the month. Highlights included tornadoes in Michigan and Ohio, floods in Indiana and Missouri, high winds in Iowa, and hail in Nebraska and Wyoming. Part of the precipitation in the northern border States was in the form of snow and freezing rain since temperatures were below normal in this area. As much as 9 inches of snow fell at Wausau, Wis., on the 6th, and Harrisburg, Pa., reported its latest snow on record on the 16th.

In the remainder of the Nation near to below normal precipitation was observed during May, except for scattered heavy showers of the summer type along the Gulf and South Atlantic coasts and in Oklahoma. Chart III shows that less than half of the normal precipitation fell in parts of the Southwest, Southeast, and Central Plains. This was the driest May on record at Concordia, Kans., with total rainfall amount 0.99 inch, and at Del Rio, Tex., with a total of only 0.03 inch. It was the third driest May at Macon, Ga., and the eighth consecutive

<sup>2</sup> For a detailed analysis of the precipitation accompanying one of these storms, see adjoining article by Oliver and Shaw.

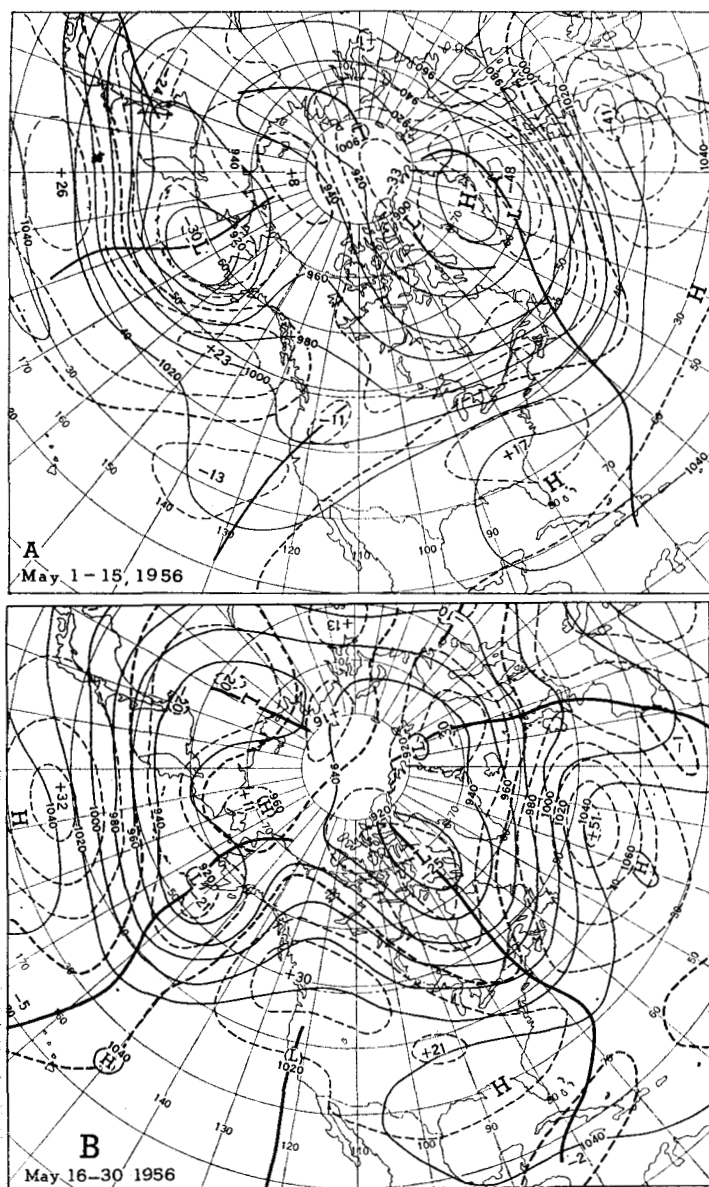


FIGURE 10.—Fifteen-day mean 700-mb. height contours and departures from normal (both in tens of feet) for (A) May 1-15, 1956, and (B) May 16-30, 1956. Note cutting off and weakening of west coast trough during second half of month as deep trough developed in eastern Pacific.

month with below normal precipitation at Des Moines, Iowa, and Wichita, Kans. This extensive dry weather in the United States occurred underneath pronounced anticyclonic circulation aloft. Figure 4 shows above normal 700-mb. heights in most of the country with two intense centers of positive anomaly, one over Tennessee and the other off the northwest coast. The marked anticyclonic vorticity associated with these centers is well portrayed in figure 9. In the Southeast strong anticyclonic shear south of the jet stream over the Great Lakes (fig. 5) combined with sharp anticyclonic curvature around the high center in Florida (fig. 4) to produce a center of intense anticyclonic vorticity over South Carolina. The desiccative effect of subsidence in regions of anticyclonic

TABLE 3.—New daily temperature records established during May 1956 at cities with extremes for both maximum and minimum readings

City	State	Maximum temperature (° F.)	Date	Minimum temperature (° F.)	Date
Alpena	Michigan	81	11	30	24
Baltimore	Maryland	94	14	41	17
Charlotte	North Carolina	95	14	44	17
Nantucket	Massachusetts	76	13	37	25
Newark	New Jersey	92	13	42	25
Philadelphia	Pennsylvania	92	14	37	17
Providence	Rhode Island	88	13	35	17
Richmond	Virginia	94	13	41	25
Wilmington	Delaware	93	14	35	17

vorticity, particularly during the warm season, has frequently been noted.

#### 4. TRANSITION WITHIN THE MONTH

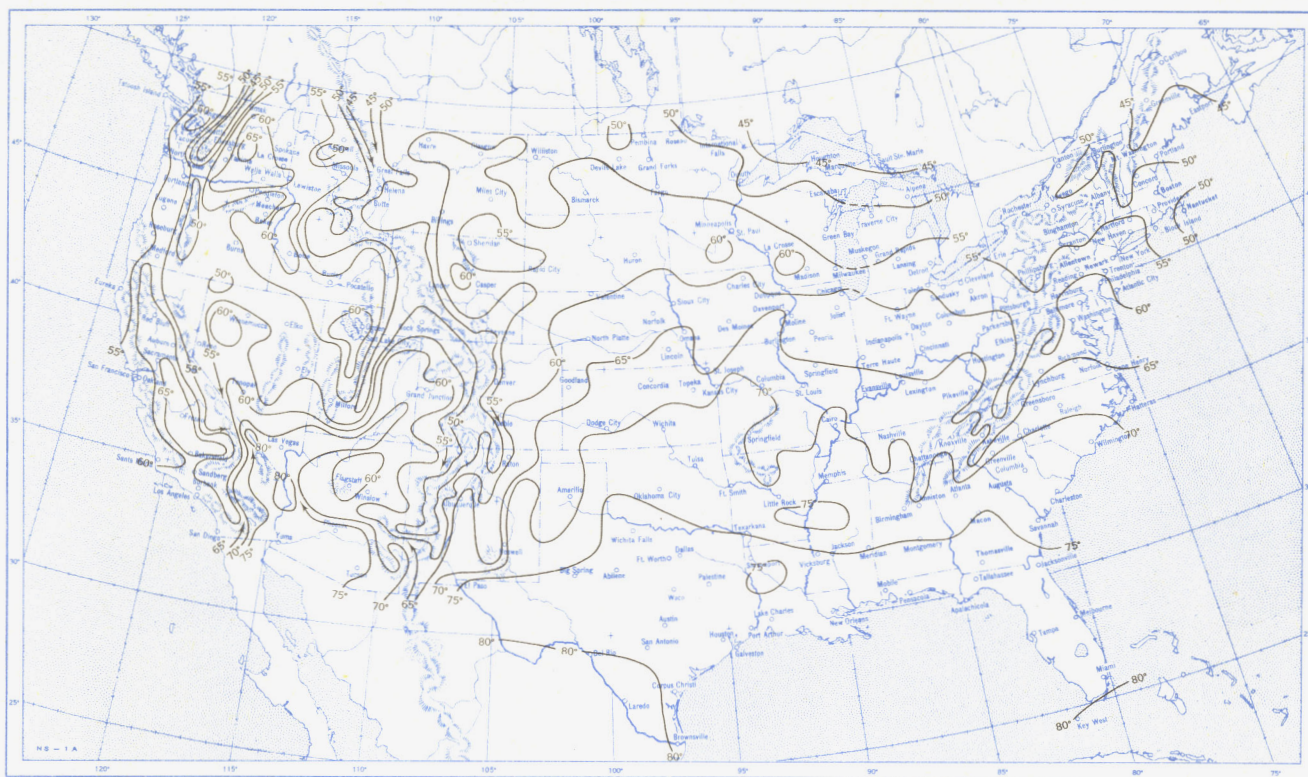
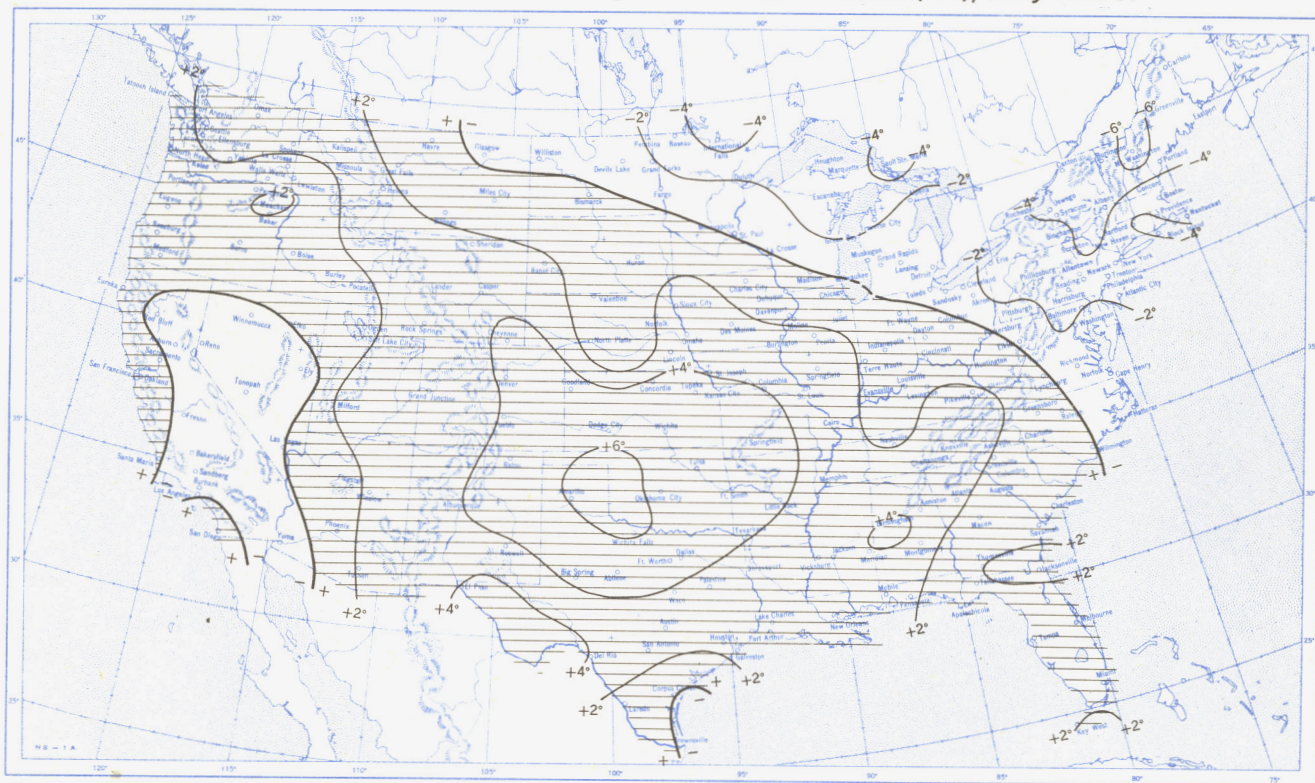
The general circulation during May 1956 was composed of two differing regimes. These are portrayed in figure 10, which shows 15-day mean 700-mb. maps for the two halves of the month. During the first half (fig. 10A), the basic pattern in the United States consisted of a deeper than normal trough along the west coast and stronger than normal ridge near the Appalachians. As a result, temperatures were cold in the Far West, but warm in the remainder of the country (except the Northeast). During the week ending May 13, surface temperatures averaged 10° below normal in Nevada, but 12° above normal in Kansas [7].

An interesting transition occurred in the second half of the month (fig. 10B). The trough which had been in the central Pacific (fig. 10A) moved eastward from about 180° to 160° W., intensified at middle latitudes, and extended its influence to low latitudes. Consequently, the trough along the west coast of the United States was bypassed by the main belt of westerlies and converted into a weak low-latitude feature, while heights rose to above normal levels throughout the western United States. At the same time, a trough in the western Atlantic retrograded to eastern North America, a strong ridge developed in mid-Atlantic, and a deep trough appeared along the European coast (fig. 10B). As a result of these circulation changes, surface temperatures averaged above normal during the second half of the month in the western two-thirds of the United States, but below normal in the East. Maximum departures of +9° F., in the Northwest and -9° F., in the Northeast were observed for the weeks ending May 20 and 27 [7].

One manifestation of this transition is the odd circumstance that several cities in the eastern United States experienced record-breaking temperatures for both maximum and minimum readings within the same month. Some of these new records, which are for individual dates only, are listed in table 3. Note that the maximum temperatures occurred during the first half of the month; the minimum temperatures during the second half. In some cases these opposite extremes were recorded only 3 days apart.

## REFERENCES

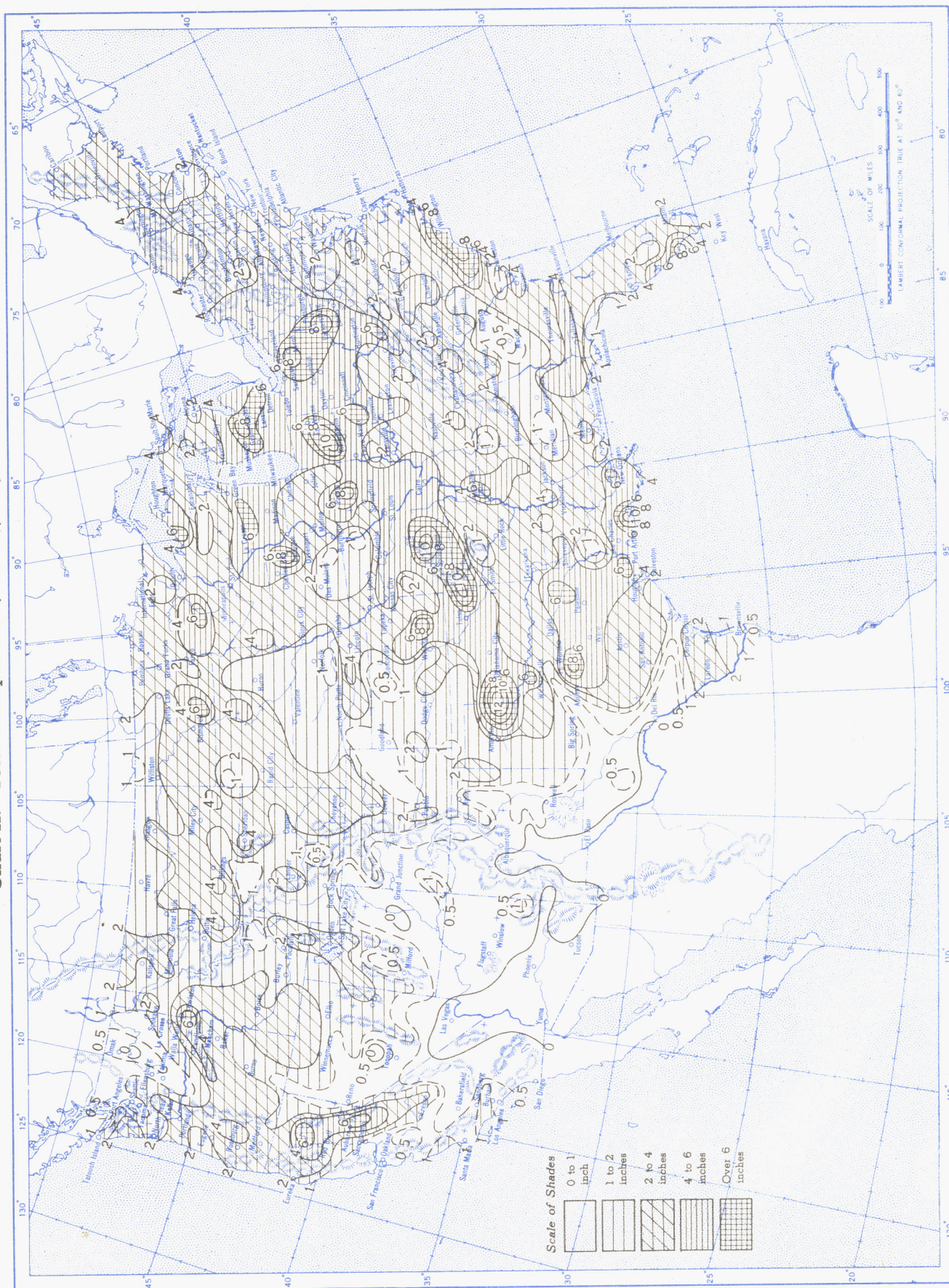
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7. *Weekly Weather and Crop Bulletin, National Summary*, vol. XLIII, Nos., 19, 20, 21, and 22, May 7, 14, 21, and 28, 1956 (charts on p. 3).

Chart I. A. Average Temperature ( $^{\circ}\text{F.}$ ) at Surface, May 1956.B. Departure of Average Temperature from Normal ( $^{\circ}\text{F.}$ ), May 1956.

A. Based on reports from 800 Weather Bureau and cooperative stations. The monthly average is half the sum of the monthly average maximum and monthly average minimum, which are the average of the daily maxima and daily minima, respectively.

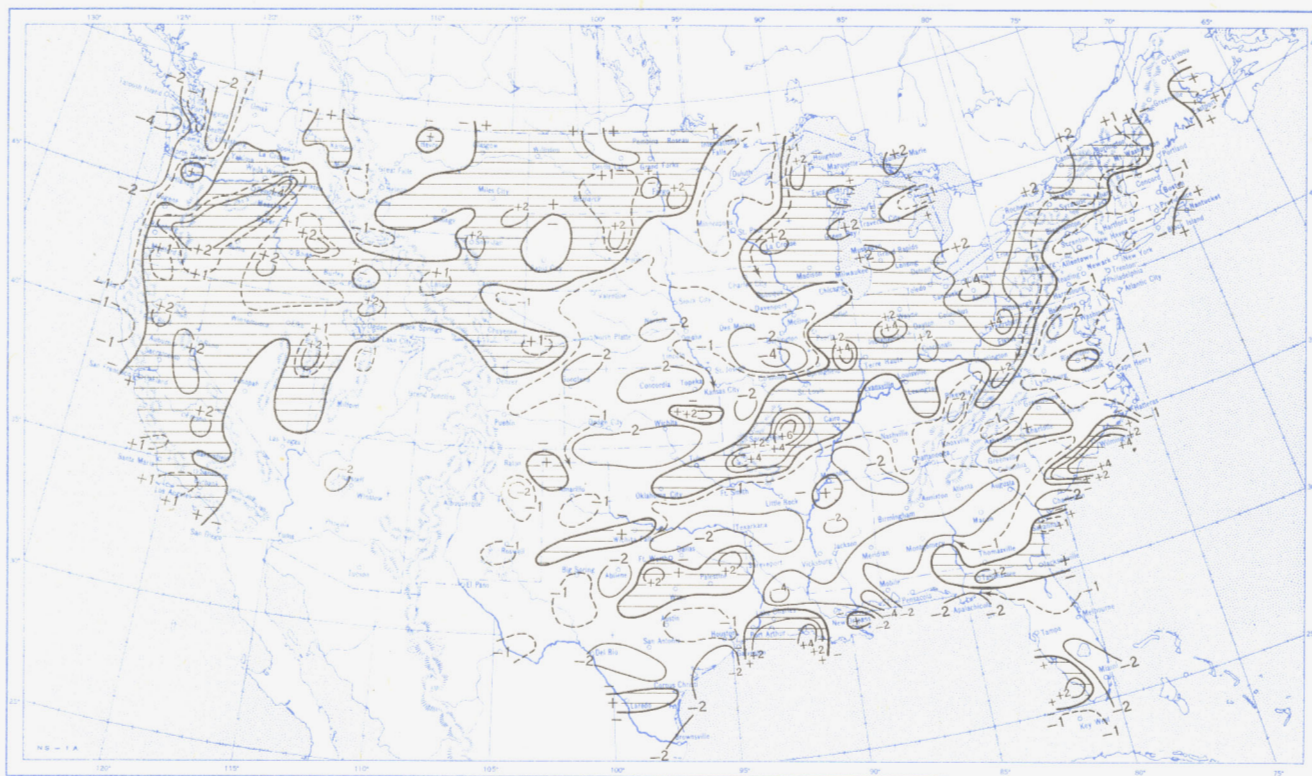
B. Normal average monthly temperatures are computed for Weather Bureau stations having at least 10 years of record.

Chart II. Total Precipitation (Inches), May 1956.

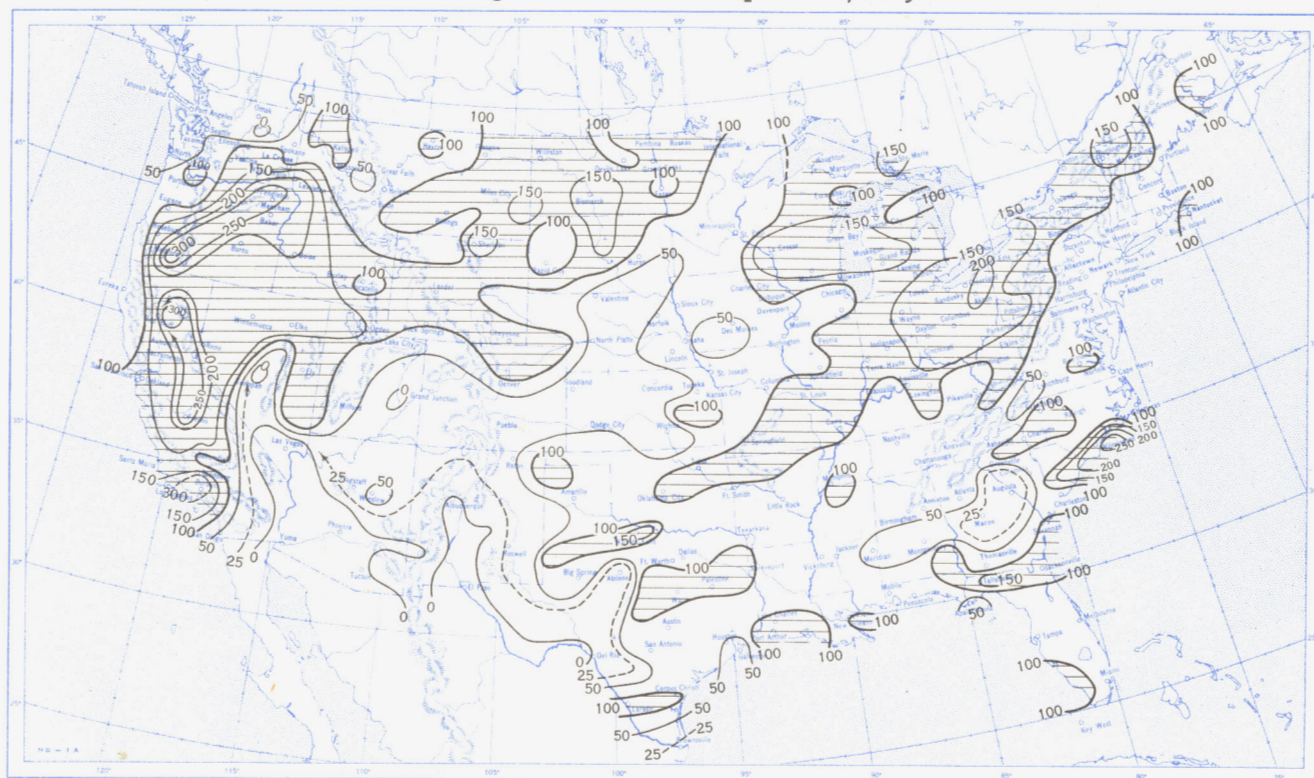


Based on daily precipitation records at 800 Weather Bureau and cooperative stations.

Chart III. A. Departure of Precipitation from Normal (Inches), May 1956.

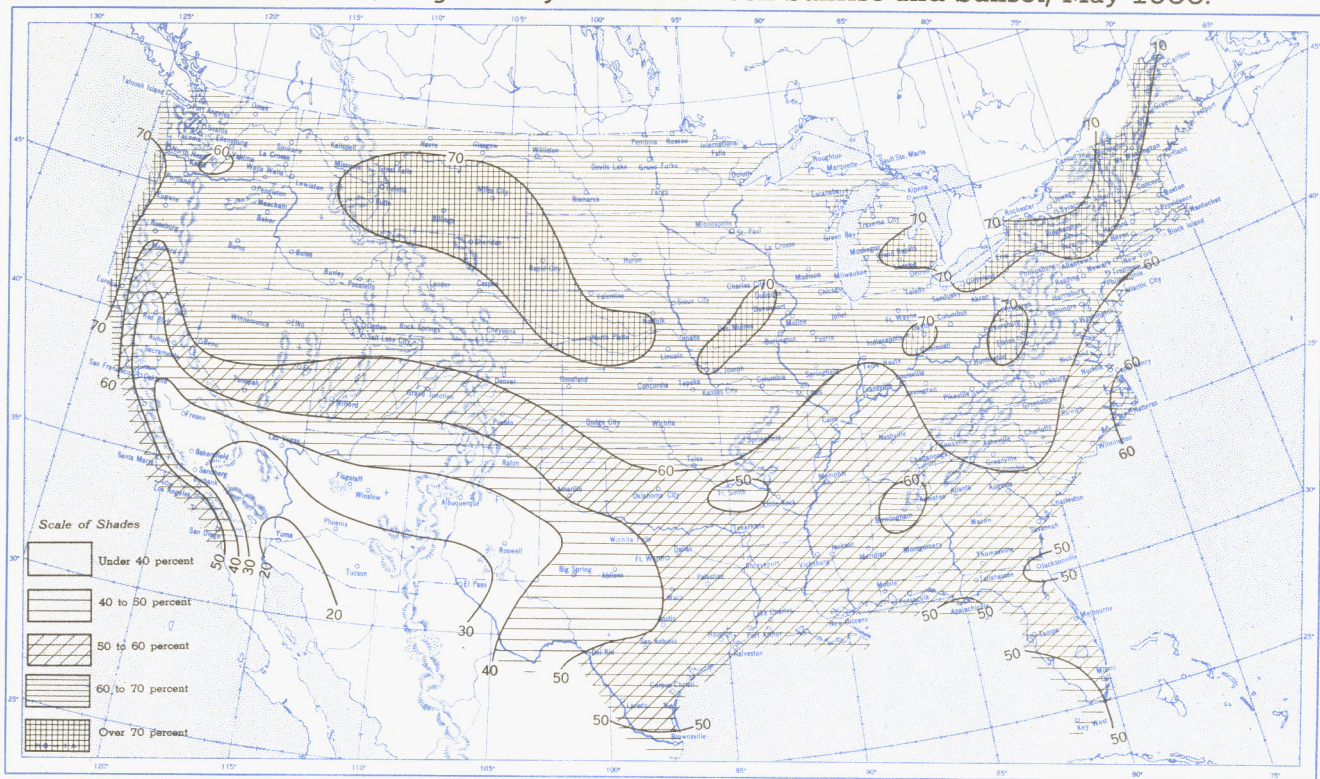


B. Percentage of Normal Precipitation, May 1956.

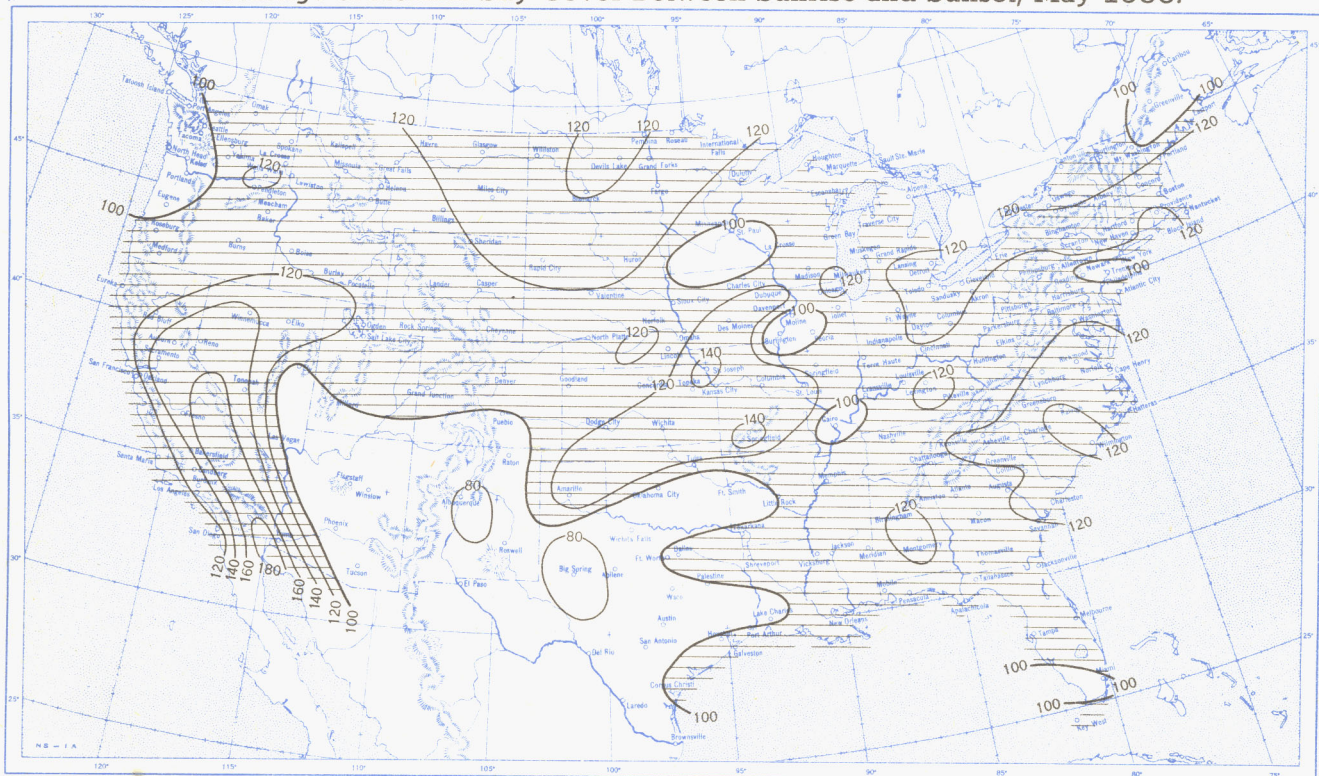


Normal monthly precipitation amounts are computed for stations having at least 10 years of record.

Chart VI. A. Percentage of Sky Cover Between Sunrise and Sunset, May 1956.

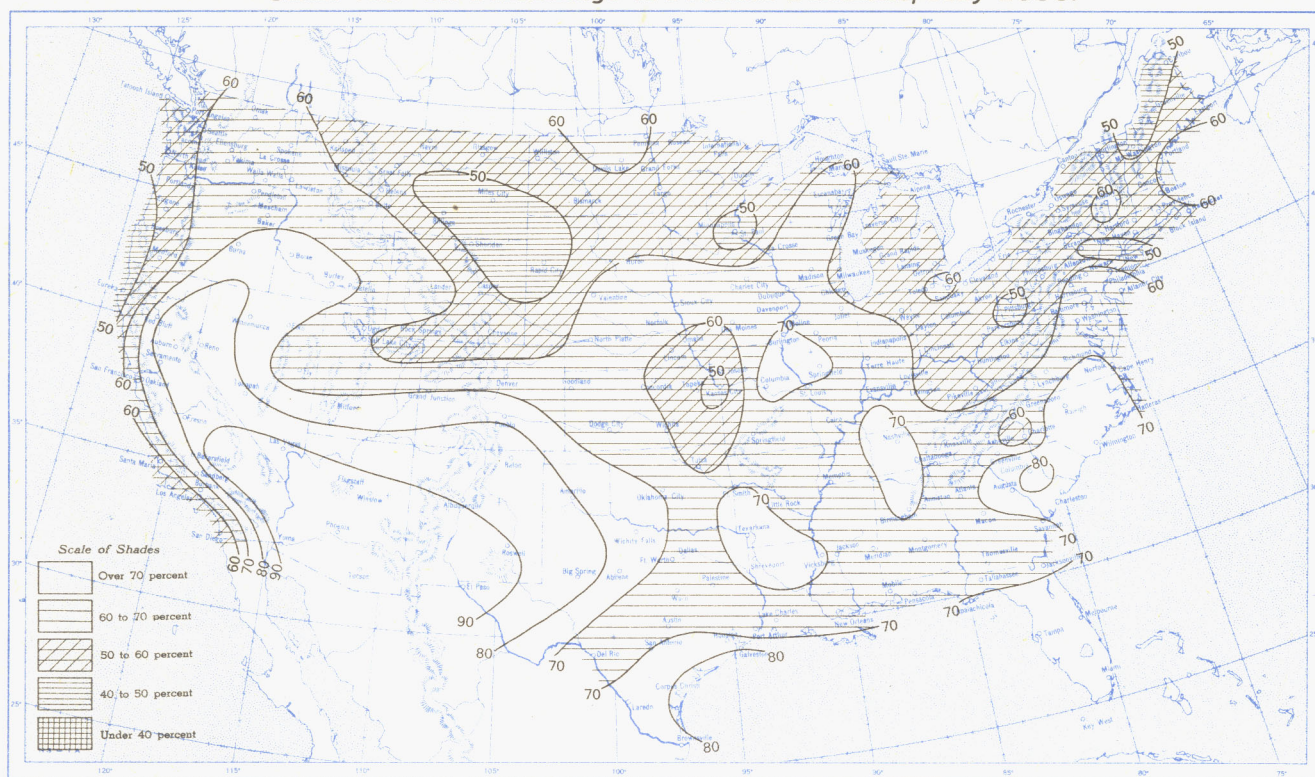


B. Percentage of Normal Sky Cover Between Sunrise and Sunset, May 1956.

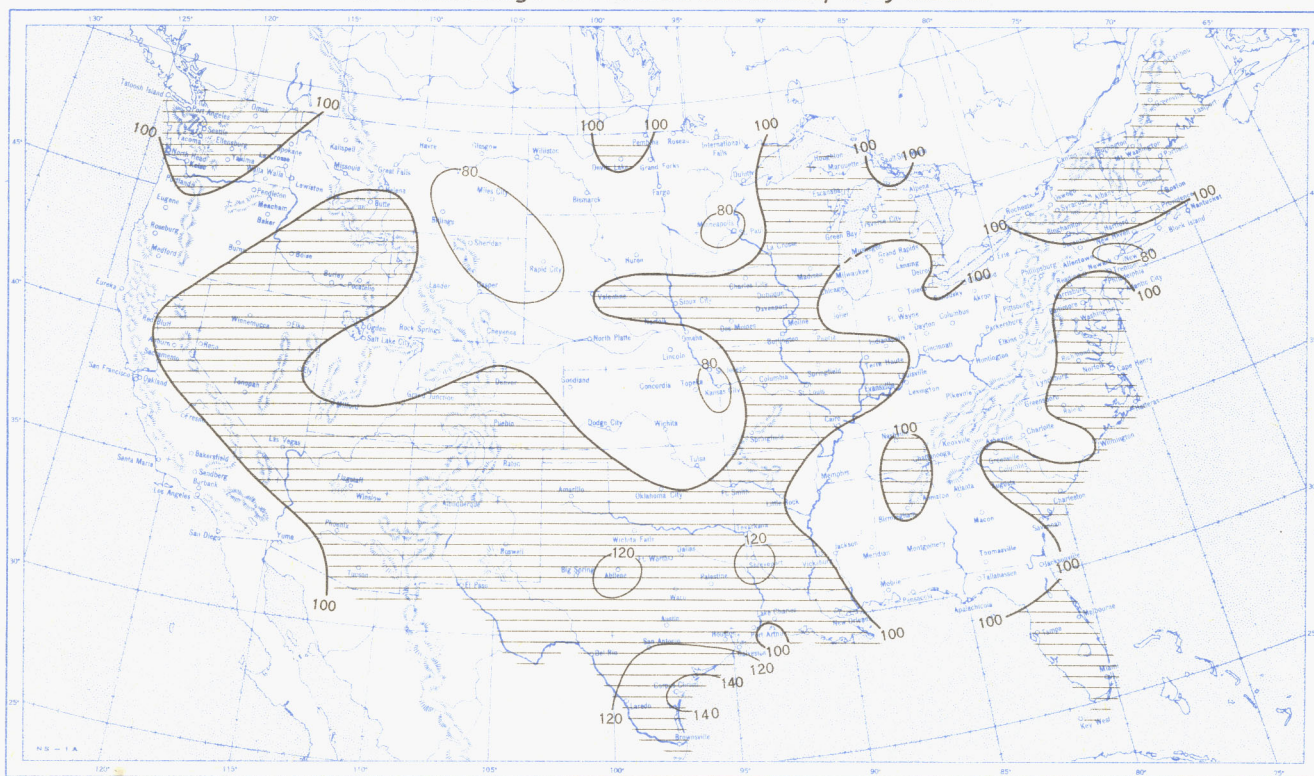


A. In addition to cloudiness, sky cover includes obscuration of the sky by fog, smoke, snow, etc. Chart based on visual observations made hourly at Weather Bureau stations and averaged over the month. B. Computations of normal amount of sky cover are made for stations having at least 10 years of record.

Chart VII. A. Percentage of Possible Sunshine, May 1956.



B. Percentage of Normal Sunshine, May 1956.



A. Computed from total number of hours of observed sunshine in relation to total number of possible hours of sunshine during month. B. Normals are computed for stations having at least 10 years of record.

Chart VIII. Average Daily Values of Solar Radiation, Direct + Diffuse, May 1956. Inset: Percentage of Mean Daily Solar Radiation, May 1956. (Mean based on period 1951-55.)

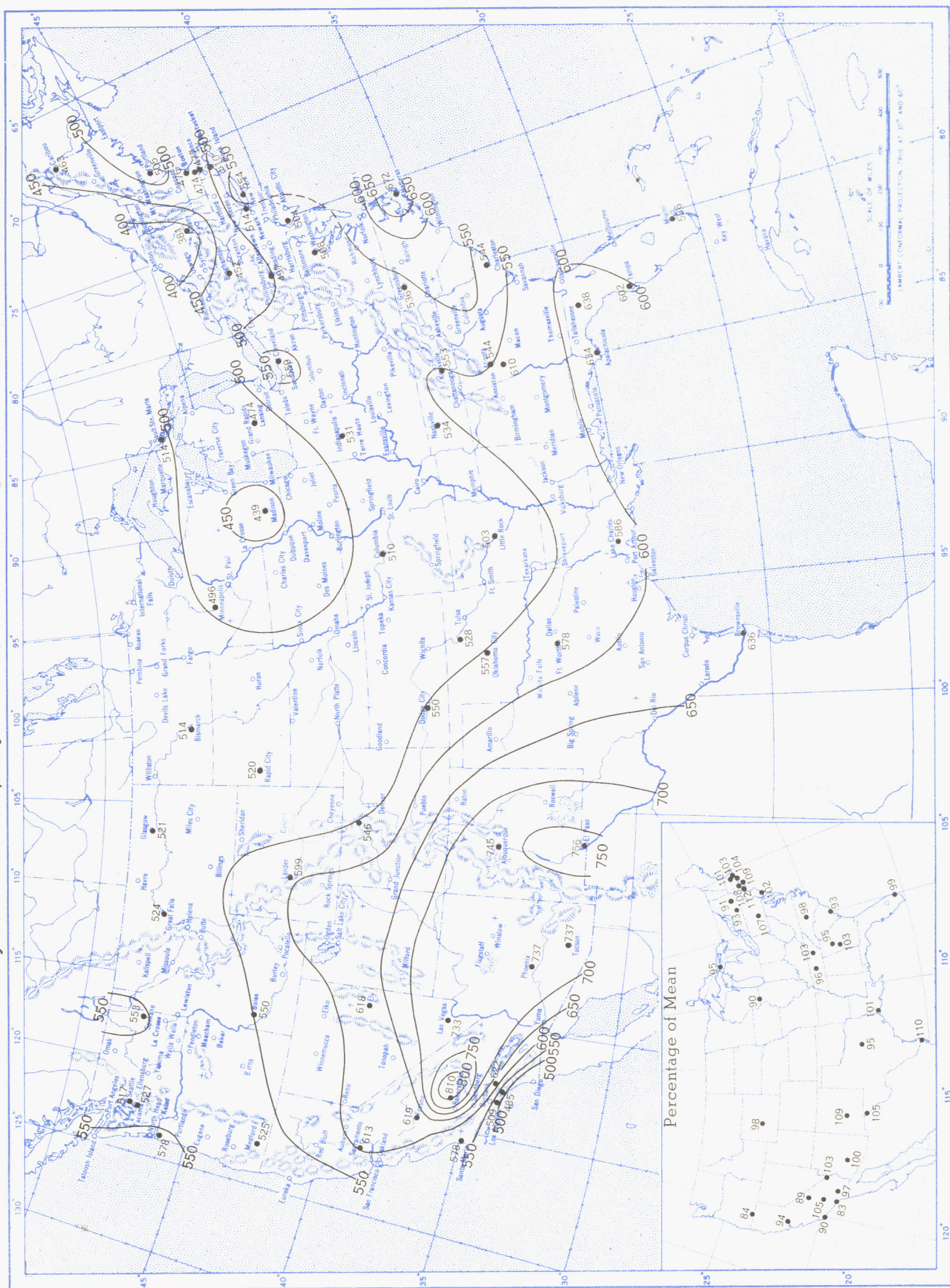
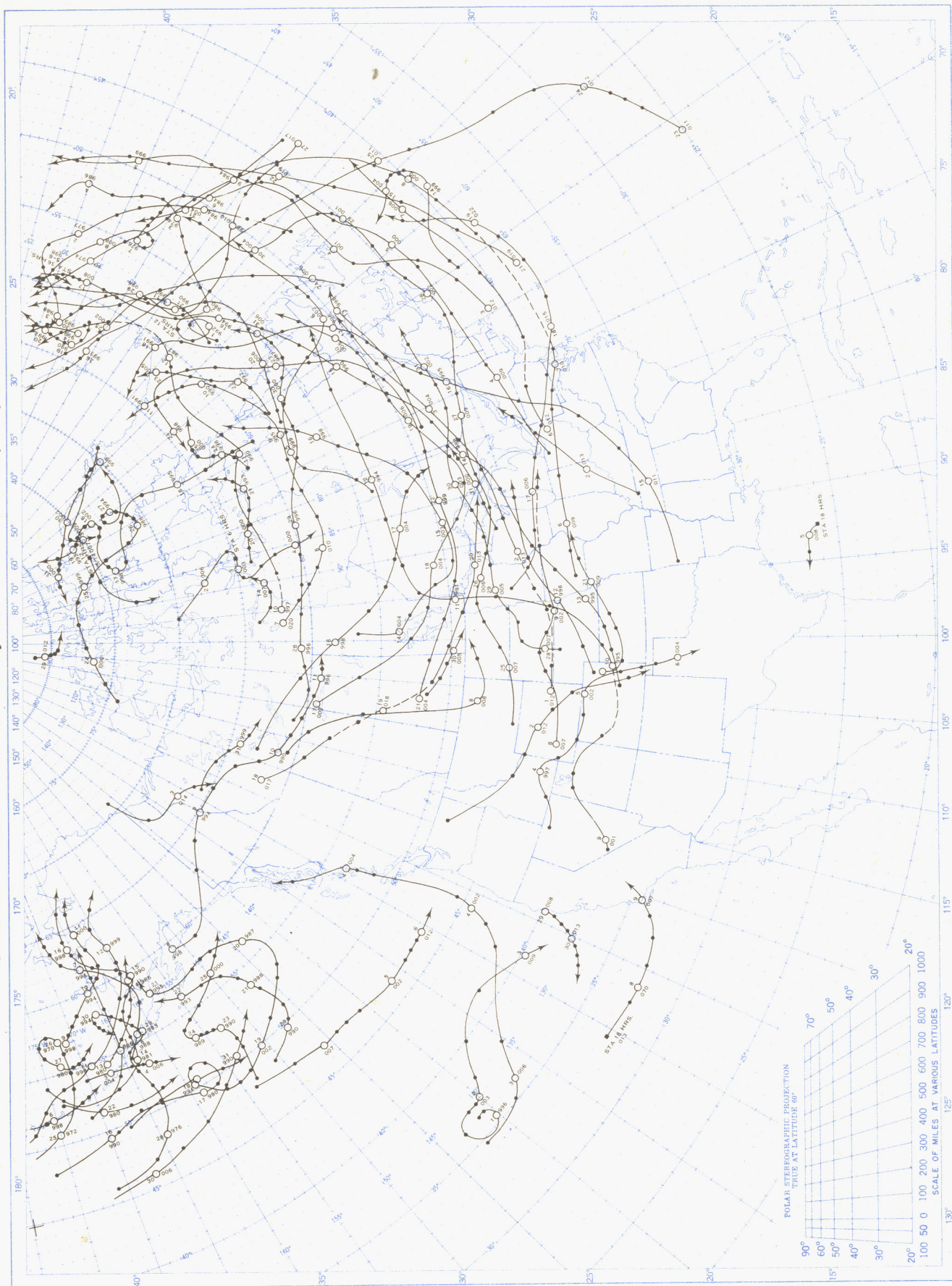


Chart shows mean daily solar radiation, direct + diffuse, received on a horizontal surface in langley (1 langley = 1 gm. cal. cm. <sup>-2</sup>). Basic data for isolines are shown on chart. Further estimates are obtained from supplementary data for which limits of accuracy are wider than for those data shown.

Chart IX. Tracks of Centers of Anticyclones at Sea Level, May 1956.

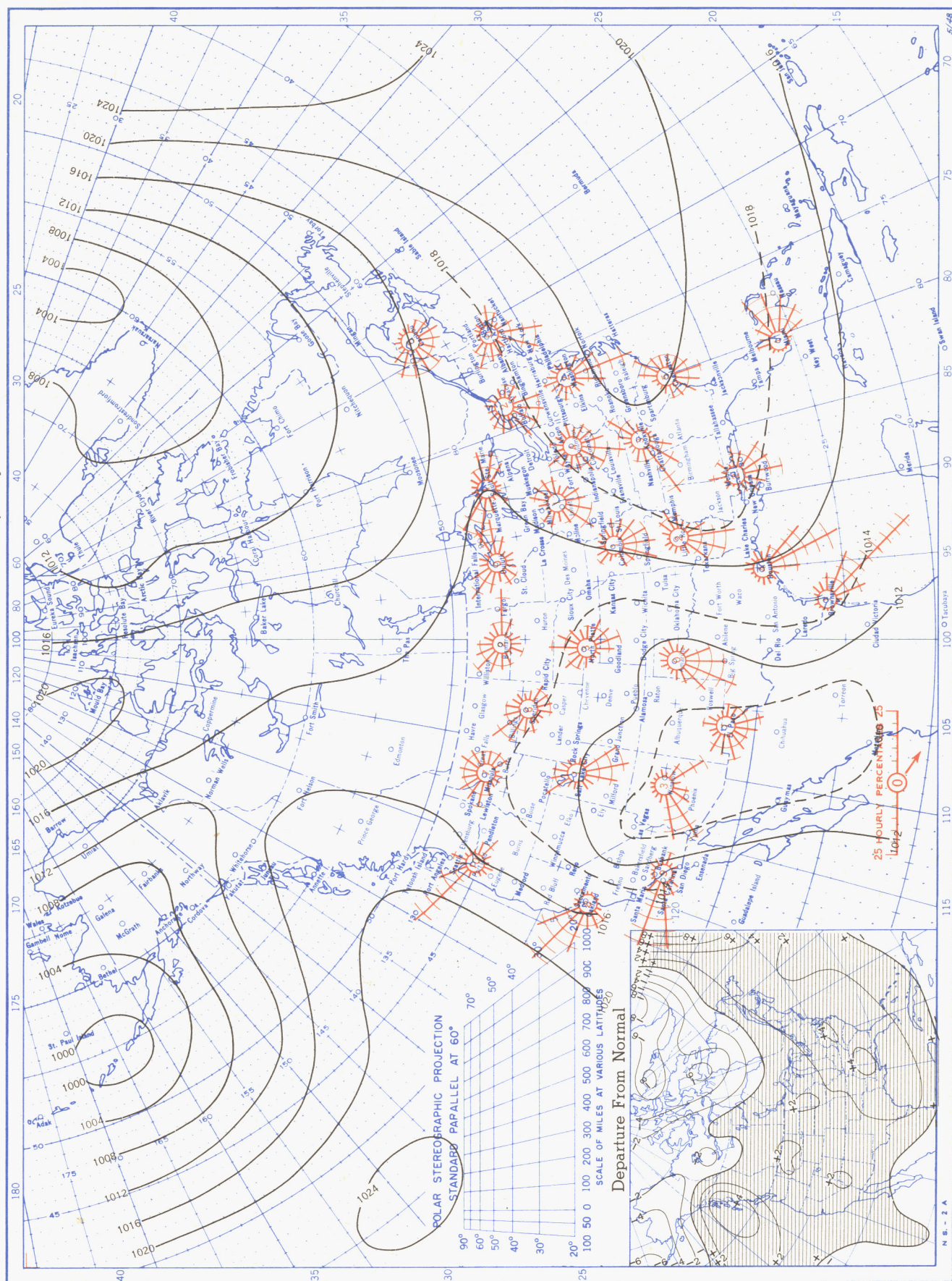
Circle indicates position of center at 7:30 a. m. E. S. T. Figure above circle indicates date, figure below, pressure to nearest millibar. Dots indicate intervening 6-hourly positions. Squares indicate position of stationary center for period shown. Dashed line in track indicates reformation at new position. Only those centers which could be identified for 24 hours or more are included.

Chart X. Tracks of Centers of Cyclones at Sea Level, May 1956.



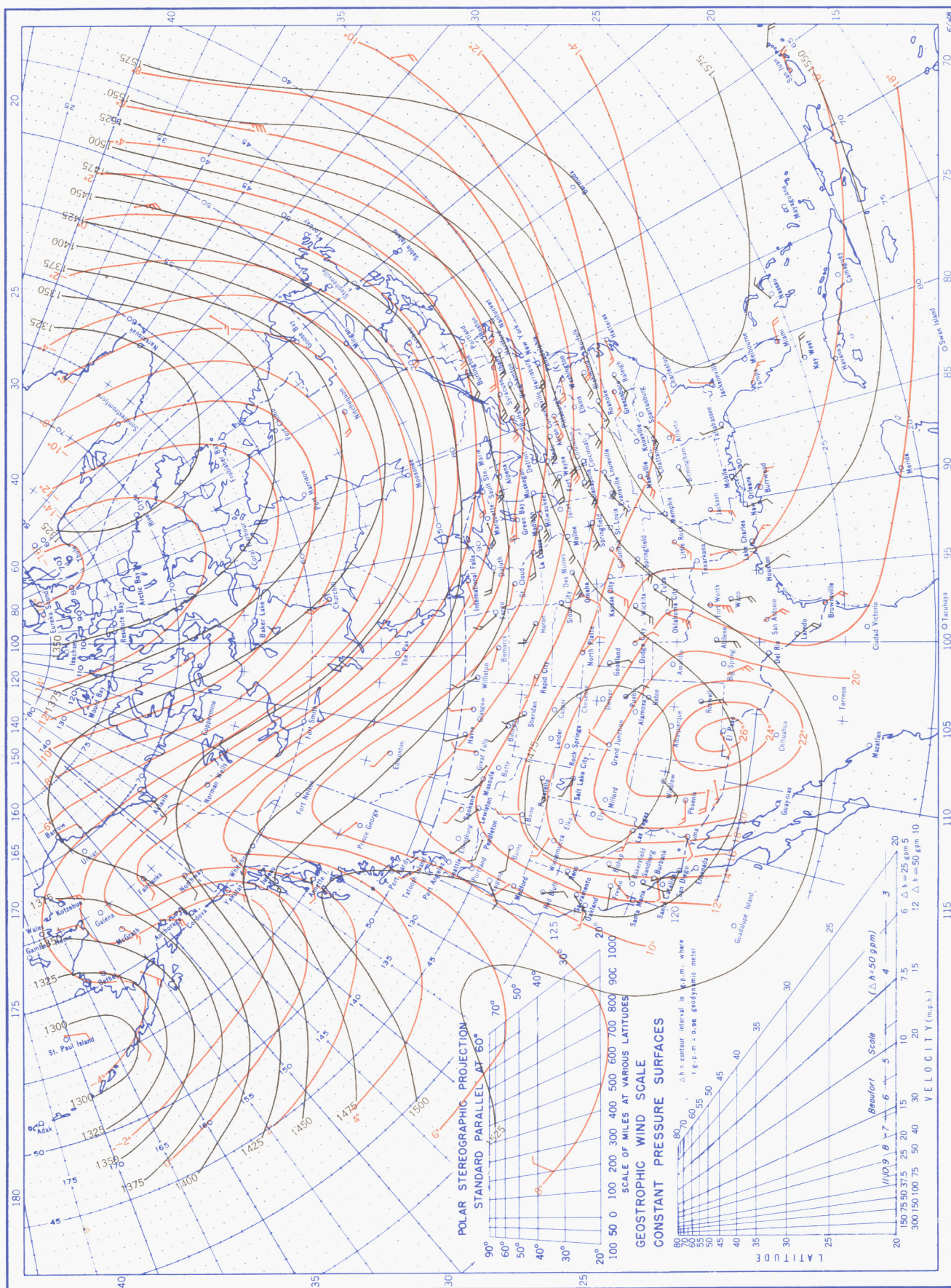
Circle indicates position of center at 7:30 a. m. E. S. T. See Chart IX for explanation of symbols.

Chart XI. Average Sea Level Pressure (mb.) and Surface Windroses, May 1956. Inset: Departure of Average Pressure (mb.) from Normal, May 1956.



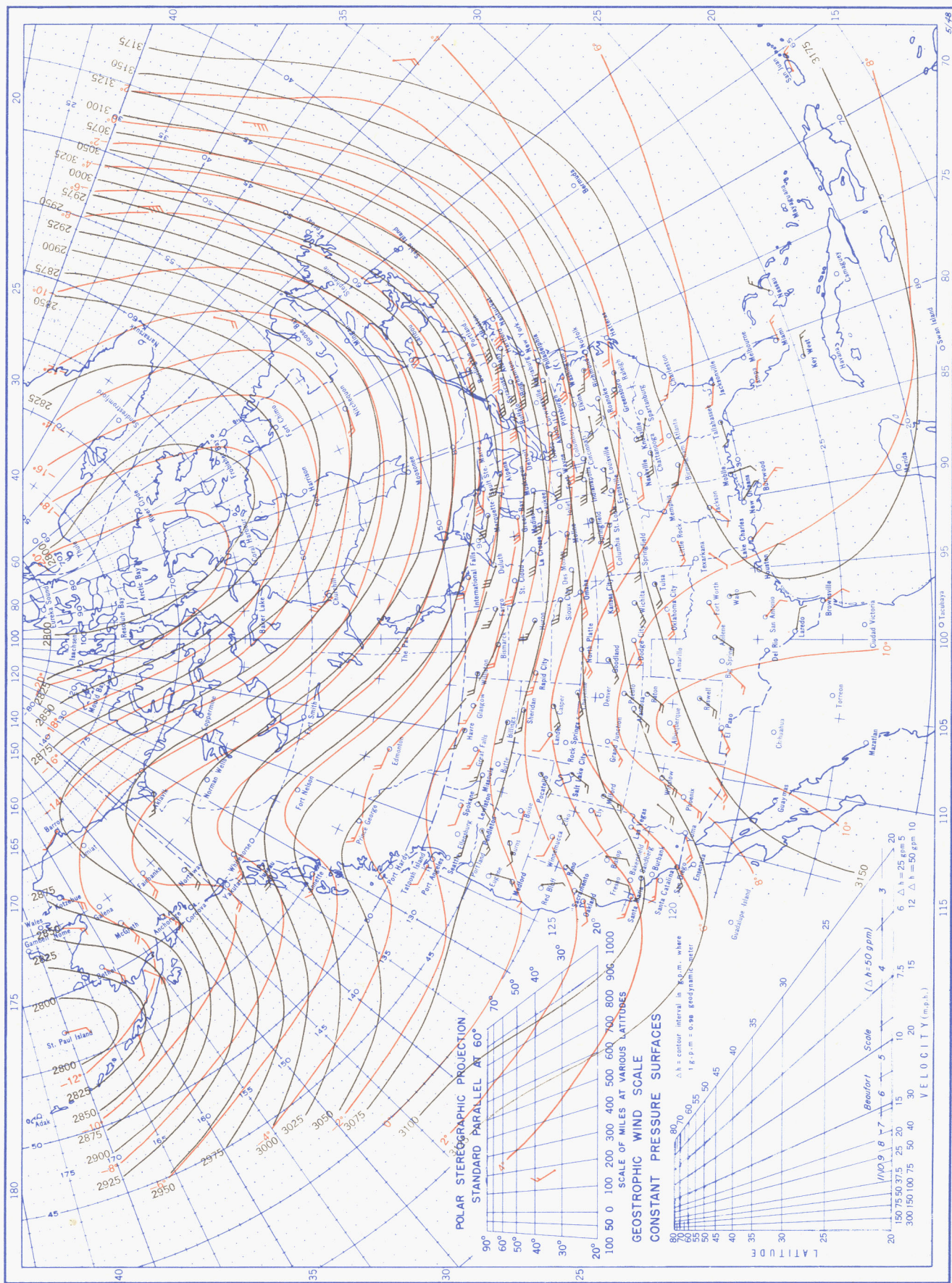
Average sea level pressures are obtained from the averages of the 7:30 a. m. and 7:30 p. m. E. S. T. readings. Windroses show percentage of time wind blew from 16 compass points or was calm during the month. Pressure normals are computed for stations having at least 10 years of record and for 10° inter-sections in a diamond grid based on readings from the Historical Weather Maps (1899-1939) for the 20 years of most complete data coverage prior to 1940.

Chart XII. Average Dynamic Height in Geopotential Meters (1 g.p.m. = 0.98 dynamic meters) of the 850-mb. Pressure Surface, Average Temperature in °C. at 850 mb., and Resultant Winds at 1500 Meters (m.s.l.), May 1956.



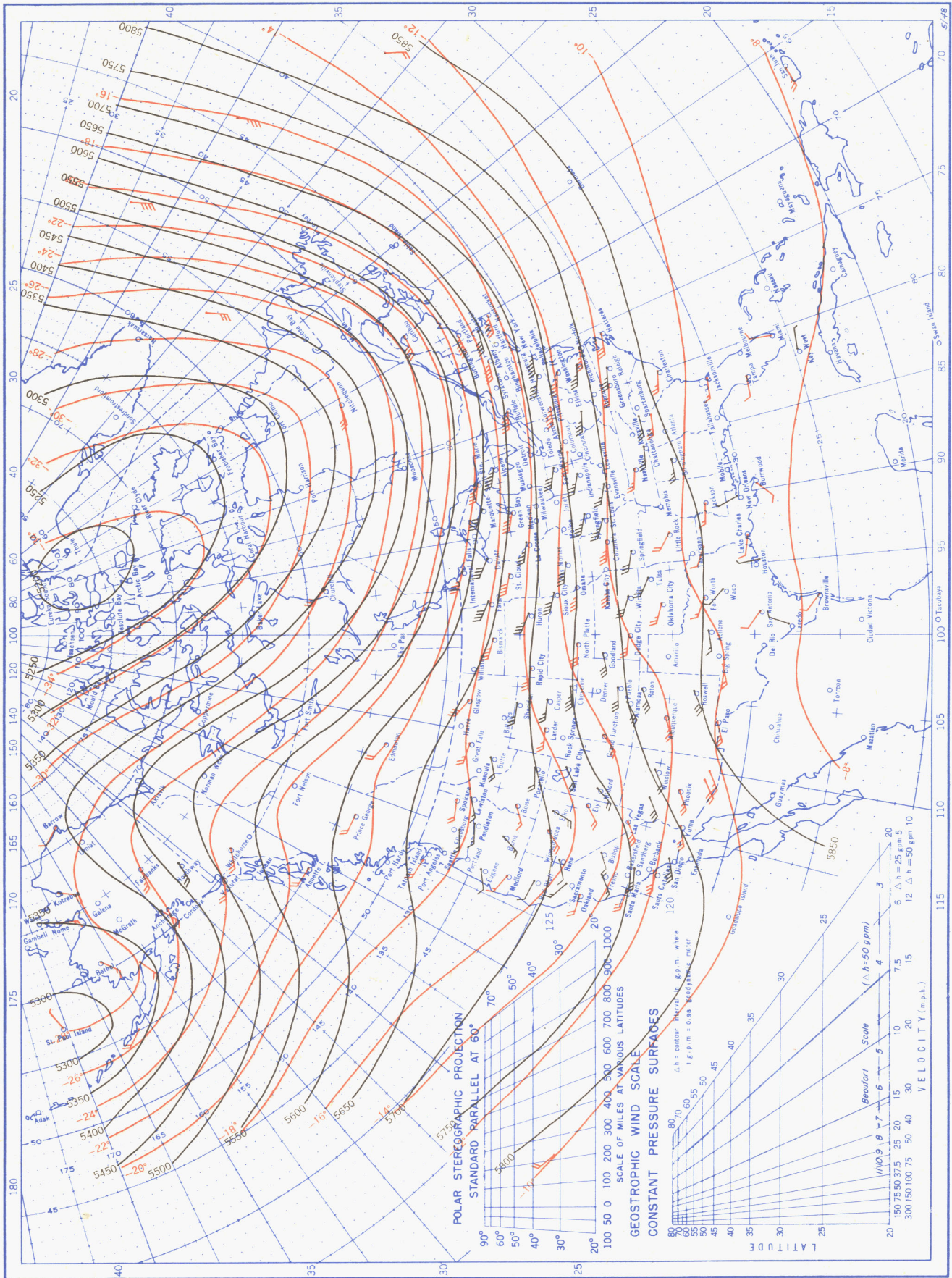
Contour lines and isotherms based on radiosonde observations at 0300 G. M. T. Winds shown in black are based on pilot balloon observations at 2100 G. M. T.; those shown in red are based on rawins taken at 0300 G. M. T. Wind barbs indicate wind speed on the Beaufort scale.

Chart XIII. Average Dynamic Height in Geopotential Meters (1 g.p.m. = 0.98 dynamic meters) of the 700-mb. Pressure Surface, Average Temperature in °C. at 700 mb., and Resultant Winds at 3000 Meters (m.s.l.), May 1956.



Contour lines and isotherms based on radiosonde observations at 0300 G. M. T. Winds shown in black are based on pilot balloon observations at 2100 G. M. T.; those shown in red are based on rawins taken at 0300 G. M. T. Wind barbs indicate wind speed on the Beaufort scale.

Chart XIV. Average Dynamic Height in Geopotential Meters (1 g.p.m. = 0.98 dynamic meters) of the 500-mb. Pressure Surface, Average Temperature in °C. at 500 mb., and Resultant Winds at 5000 Meters (m.s.l.), May 1956.



Contour lines and isotherms based on radiosonde observations at 0300 G. M. T. Winds shown in black are based on pilot balloon observations at 2100 G. M. T.; those shown in red are based on rawins at 0300 G. M. T. Wind barbs indicate wind speed on the Beaufort scale.

Chart XV. Average Dynamic Height in Geopotential Meters (1 g.p.m. = 0.98 dynamic meters) of the 300-mb. Pressure Surface, Average Temperature in °C. at 300 mb., and Resultant Winds at 10,000 Meters (m.s.l.), May 1956.

